Woods Hole Oceanographic Institution

Biology Department Seminar

Thursday, August 31, 2023 – 12:00 Noon

Intraspecific Thermal Observations Inform Phytoplankton Ecosystem Models

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The effects of temperature on phytoplankton physiology are well-documented. In ecosystem models, these effects can profoundly impact overall phytoplankton biomass and patterns of their distribution. Coccolithophores are a diverse, ecologically-important phytoplankton group ubiquitous in the global ocean and more abundant in colder, oligotrophic waters. Recent studies have suggested that coccolithophores are the least resilient phytoplankton functional type to high (>30oC) water temperatures, while others show that warm coastal areas are important coccolithophore habitats. To examine how intraspecific diversity and acclimation shape plankton populations, we grew 12 strains of *Emiliania huxleyi*, isolated from regions of different temperature, for ~45 generations (2 months), each at 6-8 temperatures. We characterized the thermal response curve and flow cytometry-derived cell sizes of each strain. Even with virtually identical temperature optima and overlapping cell size, strain growth rates varied between 0.45-1 day-1. While some thermal curves were effectively symmetrical, others had slowly declining growth rates above the "thermal optimum". Via transcriptome sequencing, we explore whether these observed differences are attributable to unique gene content. We place our experimental results in a global context using an ecosystem model simulation in which several "thermal types" are scaled by cell size, and show how coccolithophore realized niches vary. We further explore biomass changes in a model simulation we revised to incorporate the intraspecifically-diverse thermal performance curve shapes measured in the laboratory experiments. Taken together, our observed thermal traits offer expanded context for phytoplankton diversity and may reveal coccolithophores' capacity to persist under unusually warm temperatures and exploit seasonal nutrient limitation in a changing ocean.

HYBRID! **In person**: Redfield Auditorium **Zoom:** https://whoi-edu.zoom.us/j/91854162951 Meeting ID: 918 5416 2951 **By phone**: Find your local number: https://whoi-edu.zoom.us/u/abfFCGuvDj